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US AMLR Vessel Survey (*R/V Yuzhmorgeologiya*)
South Shetlands, Antarctica

1. The *R/V Yuzhmorgeologiya* is currently about 33 nautical miles south of Coronation Island, the largest within the South Orkney Islands archipelago. The past week was spent investigating the southeastern and southern shelf and slope regions down to 800 m. We have successfully completed 46 stations to date using a random depth stratified sampling design.

2. A total of 4242 Kg of finfish (18170 individuals) of 52 species have been captured and processed to date. Our greatest combined yields of finfish remain at stations taken last week north of Coronation Island within the 50-150 m depth strata. Hauls in the southern offshore areas of the South Orkney Islands have produced smaller yields of finfish per standardized area swept. Our greatest diversity of finfish species occurred at a station taken on the southwest slope at about 750 m.

3. Preliminary results from the survey underscore the zoogeographical position of the South Orkney Islands as an island group of the Southern Scotia Arc where two ichthyofaunal elements meet, the ichthyofauna of the low-Antarctic and the fish communities of the high-Antarctic. Low-Antarctic species dominate the ichthyofauna of the upper 300 m with *Gobionotothen gibberifrons*, *Champsocephalus gunnari*, *Chaenocephalus aceratus* and *Pseudochaenichthys georgianus* as the most prominent finfish species. In waters deeper than 300 m, species such as *Lepidonotothen squamifrons*, a nototeniid without antifreeze glycoprotein in its blood, and *Chionodraco rastrospinosus* becomes more dominant. Mesopelagic myctophids such *Electrona antarctica* and *Gymnoscopelus nicholsi* form another important element of the outer shelf ichthyofauna of the islands. High-Antarctic species dominate in terms of the number of species but are usually only represented by a small number of individuals. One of the few low-Antarctic species which is still found in small numbers below 500 m is *G. gibberifrons*.

4. More than 500 specimens of 52 species of finfish have been sampled for genetics and phylogenetics research. Tissue biopsies were collected for genetic studies, and voucher specimens were fixed in formalin for deposition in the fish collection at the Peabody Museum of Natural History, Yale University. One of the more interesting species is *Pogonophryne scotti* that is usually encountered in small numbers in a typical survey; the exception was the 1999 AMLR South Orkney Islands finfish survey that captured 100 individuals. Thus far the 2009 survey has captured 32 individuals. We have made important observations on diet, reproductive condition, and buoyancy on several

rare notothenioid species that includes *Bathydraco marri*, *Prionodraco evansii*, *Aethotaxis mitopteryx*, *Pogonophryne barsukovi*, *Artedidraco skottsburgi*, and *Trematomus tokarevi*. In addition, we have confirmed the presence of *Trematomus nicolai* in the South Orkney Islands. The occurrence of this species in the South Orkney Islands had been only recorded once in the 1960s, and this record was considered erroneous.

5. Benthic invertebrate catches this week totaled 1.81 metric tons over 24 stations – about half the biomass encountered the previous week. The southern shelf of the South Orkneys supports a decrease in benthic biomass as compared to the northern shelf. The least benthic biomass collected this week, 3.24 Kg, was at Station 32 directly south of Laurie Island at a depth of 314 m. The greatest, 115.58 Kg, was encountered at Station 41, ~230 m south of Coronation Island. At Station 94, off the shelf at a depth of 750 m, last week's sea pig record was beaten by almost double – 1882 *Scotoplanes globosa* sea cucumbers, weighing 70.4 Kg.

6. This year's benthic invertebrate team, led by Dr. Susanne Lockhart, includes Dr. Nerida Wilson of Scripps Oceanographic Institute and Dr. Eric Lazo-Wasem of Yale's Peabody Museum of Natural History. In addition to lending effort and expertise to the characterization and analysis of the invertebrate benthos, as well as detection of potential benthic Vulnerable Marine Ecosystem risk areas, Dr. Lazo-Wasem is compiling a comprehensive synoptic collection of species encountered at the South Orkney Islands, while Dr. Wilson collects DNA tissue samples from numerous taxa for connectivity and gene flow studies.

7. A total of 881 finfish otoliths, from 18 species (*C. aceratus*, *C. gunnari*, *C. rastrospinosus*, *G. gibberifrons*, *P. georgianus*, *L. squamifrons*, *P. antarcticum*, *G. nicholsi*, *T. eulepidotus*, *L. larseni*, *E. Antarctica*, *C. antarcticus*, *N. coriiceps*, *T. hansoni*, *G. braureri*, *N. rossii*, *L. nudifrons*, *D. mawsoni*) were collected through this week, bringing total otolith collections to 1617. These otoliths are to be used in age estimation and stock assessment studies based at the Center for Quantitative Fisheries Ecology (CQFE), Old Dominion University (ODU), Norfolk, Virginia. In addition, otoliths and gonads for C. aceratus are being collected for examining age and growth, reproductive biology, and population structure of this species. Otoliths of *P. antarcticum*, *D. eleginoides*, *D. maswoni*, and *N. coriiceps* are also being targeted towards the fulfillment of connectivity and population structure projects based at the CQFE. To date, 292 (of the 1617 total otoliths collected) were *C. aceratus*; 23 *N. coriiceps*. A total of 95 gonads (male and female, stages 1-3) were collected from *C. aceratus*, and the gonads of four other species (*C. rastrospinosus*, *P georgianus*, *N. coriiceps*, *N. rossii*) are also being targeted for histological studies based at the CQFE and the CNR in Ancona, Italy. Thus far, 2 gonad collections (1 stage 3 female, and 1 stage 3 male) have been made for *N. rossii*.

8. For other population genetic studies of nototheniod fishes along the Scotia Ridge, a further 244 tissue samples have been collected within the Channichthyidae and Nototheniidae taxa, resulting in a total of 603. Thus far, sufficient material for the

South Orkney Islands has been collected from *Lepidonotothen squamifrons*, *Trematomus eulepidotus*, *T. hansoni*, *Champsocephalus gunnari*, *Chionodraco rastrospinosus* and *Cryodraco antarcticus*. An additional 34 tissues of individuals from Bathydraconidae (9) and Artedraconidae (25) have been sampled. Furthermore, 68 myctophids (*Electrona antarcticum*, *Gymnoscopelus nicholsi*) were processed for comparative studies. For the analyses of phylogenetic relationships among nototheniods through means of Expressed Sequence Tags (ESTs), tissue collections of brain, liver and muscles of channichthyid and notothenid species have been made. To date, nine species each represented by two individuals were sampled.

9. Eleven IKMT net deployments have been completed since the start of Leg II with krill (*E. superba*) catches ranging from zero to 3,995. The IKMT is the standard net used by the AMLR krill/zooplankton survey. The purpose is to determine the krill length frequency distribution in the South Orkney area in order to formulate the acoustic estimates of krill biomass. We have measured 413 krill to date. The mean length (Standard length 1) was 46 mm. Zooplankton specimens have also been collected for E. Lazo-Wazum (primarily amphipods), J. Moore/M. Goebel/J. Gafney (adult fish), T. Near (larval fish) and N. Wilson (*Clione spp.*). The remaining samples were preserved for future analysis.

10. Unpredictable surface swell, inconsistent towing speed and cable angle resulted in a low yield of quality still and video camera footage, and necessitated a re-engineering of the camera towing system. Collaboration between the operator, scientists and a very resourceful Russian deck crew, resulted in the design, construction and deployment of a towed-ski configuration. The towed-ski/camera configuration (a.k.a Ski Monkey) allows the camera system to be deployed at a fixed altitude off the seabed has and resulted in a great increase of high quality still and video footage. Two successful deployments using the Ski Monkey configuration have been executed thus far.

11. Krill NASC values remained low this week. Highest concentrations of krill were found around station 40-29 south of the western tip of Laurie Island. NASC values range from 0 to 212.

12. Antarctic fur seal scat is being processed onboard for dietary components. A random sample of 25 krill carapaces are isolated from each sample and measured for length and width. Additionally, all otoliths are removed from each scat. To date, 62 scats have been processed. Of the 62 scats, all but one contained krill, 11 contained one or more otoliths, and three contained squid beaks. Also, lipids are being extracted from milk samples collected from lactating fur seals. Currently, 87 milk samples have had lipids extracted. Remaining work includes processing 8 more scat samples, identifying the otoliths obtained from scat samples, and extracting lipids from 26 more milk samples.

13. An additional 9 CTD stations were processed, bringing the total number of stations to 21. CTD operations were put on hold for two days due to heavy seas. Maintenance was limited to the servicing of CTD Altimeter module.

14. A slow climb in air pressure from 980 to 1010 millibars, accompanied by moderate southwesterly winds averaging 10 knots made for a calm, but cold start to the week with air temperature hovering around the 0° C mark. Tuesday saw the barometer fall sharply to 980 millibar resulting in Northerly gusts in excess of 50 knots. A further 30 millibar drop in air pressure and sustained Northerly winds averaging 35 knots produced swells of up to 5 meters, forcing all deck activity to be put on hold for most of Wednesday and Thursday. Moderate Northwesterly winds averaging 15 knots saw calmer conditions return over the weekend, with air temperature dropping to a minimum of -1.8 °C on Saturday.

Report submitted by AMLR researchers aboard the *R/V Yuzhmorgeologiya*, conducting surveys of the pelagic ecosystem in the peninsula region of the Antarctic. These reports are posted at http://swfsc.noaa.gov/aerd-field.aspx ; blogs from the field are also posted at the same website. Photos by M. Goebel (NMFS/AERD).